

## **While attempting polio eradication, Africa struggles against outbreaks**

*Besides, smallpox poliomyelitis has been singled out as another candidate for eradication. Wild polio cases almost disappeared from Afghanistan and Pakistan, the last refugium of the wild virus. But the oral polio vaccine enabled a polio mutant to spread in Africa.*

Fortunately, [poliomyelitis](#) no longer threatens children with paralysis and death in Thailand. In 2016 the Ministry of Public Health (MOPH) stated that Thailand is polio-free. The last case was reported in 1997 and involved a case from Loei, who fell ill at Khon Kaen (1). To be safe, polio vaccination is still included in the [vaccination recommendation](#) for children. Thailand joined the global eradication program in the 1980<sup>th</sup>, which has turned out to be a success not only in Thailand but also in many countries throughout the world (2). Few cases infected by the wild type were still only seen in Afghanistan and Pakistan. A short note in science reported that the “wild” poliovirus was wiped out in Africa (Science No. 6506, page 886, 2020). However, the Science issue on 11 March 2022 claimed that polio outbreaks are out of control in Africa (3).

### Vaccine-driven-polio

The latest article displayed two graphs showing the decline of “wild” polio cases in Afghanistan, Pakistan, and the rest of the world. A second graph revealed vaccine-derived polio cases in Afghanistan, Pakistan, and Africa. After a peak of over 400 cases, the vaccine-derived polio cases declined in 2021, but more than 500 cases remained in Africa. The two graphs illustrate a major calamity in vaccine development, described in a [previous entry](#) to this blog.

Children in affluent countries were vaccinated with the Salk inactivated polio vaccine (IPV) through injections. The more easily applied Sabin oral poliovirus vaccine (OPV) was used for the eradication program, mainly in low- and middle-income countries. OPV included [attenuated](#) strains of the three serotypes of the virus. The vaccine created immunity against the virus in the gut, but unfortunately, the attenuated strains had the potential to be infective through mutation and were defecated from vaccinated children (4). In the case, vaccination didn’t result in herd immunity among children, and because of delayed intervals between vaccination campaigns, the mutated virus caused “circulating vaccine-derived poliovirus (cVDPV)”. Although OPV2 replaced the OPV vaccine, cVDPV still emerged (5).

### From the trivalent to the bivalent vaccine and the failure of the monovalent vaccine

As a response, the Global Polio Eradication Initiative (GPEI) altered the vaccine whenever one serotype was gone. In 1999 type 2 was “last seen”. In 2016, most countries stopped using the trivalent OPV and used a bivalent version, for which type 2 was omitted. It was expected that this would eradicate polio, and OPV would not be used further. However, type 2 emerged again, and where this happened, a monovalent type 2 (mOPV2) vaccine was used. This strategy worked in some countries, but in others, new polio outbreaks took place altogether in twenty-three countries, predominantly in Africa (6). Finally, with funds from the Bill & Melinda Foundation and produced by an Indonesian company, work started on a novel OPV2 (nOPV2) vaccine, trying to engineer the vaccine to be “genetically” more stable (6). The nOPV2 vaccine began to

be used by a few countries from March 2021 onwards, authorized under the assumption that it must be used in an emergency.

### Afghanistan, Pakistan, and Nigeria

To consider the situation as an emergency certainly was justified. Vaccine-derived poliomyelitis paralyzed more than 500 children in 2020 and again in 2021 in two dozen countries in Africa (3). The outbreaks were driven mainly by the type 2 of the virus. While the situation in Afghanistan somehow was under control and quite satisfying in Pakistan, the two countries remain as the source of the wild type, while Nigeria “is the most important generator” of the vaccine-derived polio cases.

After Afghanistan was entirely overtaken by the Taliban again, the house-to-house vaccination was allowed, even now in those places where formerly vaccination was banned. In these areas, 3.5 million children remained without protection against polio. Pakistan was fairing quite well, while Prime minister Imran Khan even supported the campaign. Khan was pushed out as Prime minister by the parliament while writing this manuscript. He claimed that outside forces were behind the move. Also, the future of the eradication program in Afghanistan seems to be worrisome, while recently, “gunmen” killed eight polio workers in the northeast of the country.

### Waiting for the new vaccine

Ironically the decline of the polio eradication program in Africa was indirectly caused by the newly developed nOPV2 vaccine, which had just started to be available. Many health authorities in African countries lost trust in the available polio vaccines and waited for the new one. They didn't consider the polio situation in their country as a serious health problem and, while waiting for the new vaccine, took no action to work against further outbreaks. They should have known better. Nigeria, for instance, exported the vaccine-derived virus to 18 countries. Authorities were advised to use any available vaccine when necessary. They also were warned that the new vaccine might not be a magic bullet. In addition, campaigns even with the nOPV2 are of “poor quality”. For example, Nigeria now used only 184 million doses of nOPV2 from 255 million doses, while outbreaks still occurred.

### Outlook

The example of the failed polio eradication attempt so far is a grim reminder that best intention and seemingly favorable conditions cannot assure a successful outcome. Evolutionary mechanisms of the virus, and a tricky, complex immune system so far overpowered science. Vaccination now is necessary against a virus created by a vaccine. Administrative difficulties and political disturbances cause additional constraints on the eradication program. A lot of effort and more time is needed before eradication can be achieved to succeed. In the year 2020, Africa was declared free of the wild poliovirus. However, in November 2021, a 3-year-old girl in Malawi was paralyzed by a wild poliovirus that might have originated from Pakistan. Poliovirus spots remain in a Pakistani province in the neighborhood of Afghanistan. Several positive cases were detected in December 2021 in that province. Migration from Pakistan to Afghanistan and back might spread the virus further in both countries. Pakistan, a South Asian country, isn't that

far away from Thailand and other Asian countries. Maybe it is not such a bad idea to keep vaccination against poliomyelitis within the overall immunization recommendations.

### Literature

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Frank P. Schelp is responsible for the content of the manuscript, and points of view expressed might not reflect the stance and policy of the Faculty of Public Health, Khon Kaen University, Thailand

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